Simulating the impact of hybrid functionality on CHAPS banks

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Overview

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4. Results
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6. Summary and conclusions

Introduction

- **RTGS: provides immediacy & eliminates credit exposures between members, but can impose high liquidity demands**

- **Growing adoption of ‘hybrid’ designs (mix of RTGS and DNS) to improve liquidity efficiency**

- **<u>Policy question</u>:** would CHAPS banks benefit from the introduction of a hybrid system design?

Related literature

- **Willison (2004):** RTGS and hybrid payment systems: a comparison
- **Martin and McAndrews (2007):** Liquidity-saving mechanisms
- **Johnson, McAndrews and Soramaki (2004):** Economising on liquidity with deferred settlement mechanisms

Aim to fill existing gaps by...

- Simulating RRGS on CHAPS: a system where intraday overdrafts are free but collateralised
- Assessing the impact on individual banks
- Endogenising payment submission behaviour
- Comparing real and synthetic payment data

Definition: Hybrid functionality

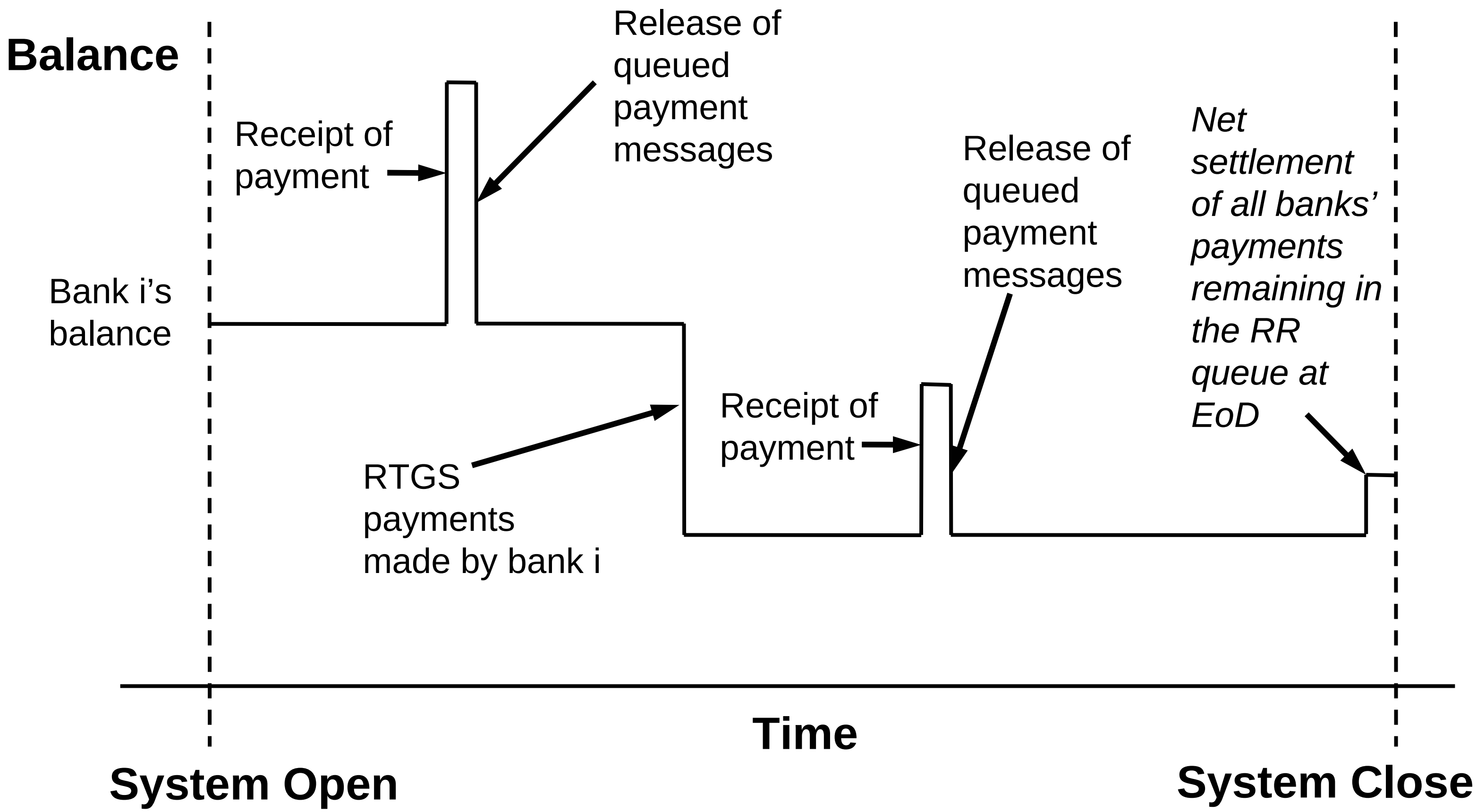
Two main types of hybrid payment systems:

1. Continuous Net Settlement (e.g. CHIPS)
2. Queue Augmented RTGS (e.g. $RTGS^{plus}$, TARGET2)

We focuses on queue augmented designs:

- Liquidity is reserved for time-critical payments
- Less urgent payments queued and released in liquidity efficient manner
- Balance reactive and receipt reactive queue release methods are used.

Receipt-reactive settlement



Source: BoF-PSS2 User Manual Version 2.2.0

Baseline Simulation

Simulation: 1 month of CHAPS payments settled RTGS.

Outputs:

- Daily max liquidity need for each user
- Mean liquidity usage and daily st. dev. at aggregate and bank level
- Aggregate value-weighted average time of settlement

Receipt-reactive simulations

Simulation: CHAPS data settled RRGS

Inputs:

- Payment priorities - two approaches used:
  1. **Largest payments** are time-critical
  2. **A fraction of payments** are time-critical
- Time period parameter – whole CHAPS day
- Early submission of non-urgent payments

Outputs: Same statistics as for baseline simulations

Results: System level

Time-critical payments		% Δ liquidity requirement			Settlement delay
Criteria	Proportion	Mean			
$\geq$ £100mn	54%	-2			
$\geq$ £500mn	12%	-10			
$\geq$ £1bn	4%	-38			
Random 50%	51%	-1			
Random 10%	11%	-12			
Random 3%	4%	-37			

Results: System level

Time-critical payments		% Δ liquidity requirement			Settlement delay
Criteria	Proportion	Mean	St dev	Max	
≥ £100mn	54%	-2	+1	0	
≥ £500mn	12%	-10	+10	+3	
≥ £1bn	4%	-38	0	-9	
Random 50%	51%	-1	-2	-1	
Random 10%	11%	-12	-10	-8	
Random 3%	4%	-37	-18	-16	

Results: System level

Time-critical payments		% Δ liquidity requirement			Settlement delay
Criteria	**Proportion**	**Mean**	**St dev**	**Max**	**hh:mm**
≥ £100mn	54%	-2	+1	0	+00:01
≥ £500mn	12%	-10	+10	+3	+00:12
≥ £1bn	4%	-38	0	-9	+00:37
Random 50%	51%	-1	-2	-1	+00:01
Random 10%	11%	-12	-10	-8	+00:11
Random 3%	4%	-37	-18	-16	+00:25

Results: Bank groupings

Δ Mean liquidity requirement (≥£1bn time-critical)	**Banks**	**Average value settled**	**RTGS recycling ratio**
$MLR_i > 0\%$	2	27%	30
$0\% > MLR_i > -40\%$	2	9%	14
$MLR_i < -40\%$	8	3%	9

Results: Generated data

Similarities with CHAPS:

- Liquidity savings large when significant value of payments queued
- Still find difference in volatility between volume and value thresholds
- Heterogeneous effect across banks

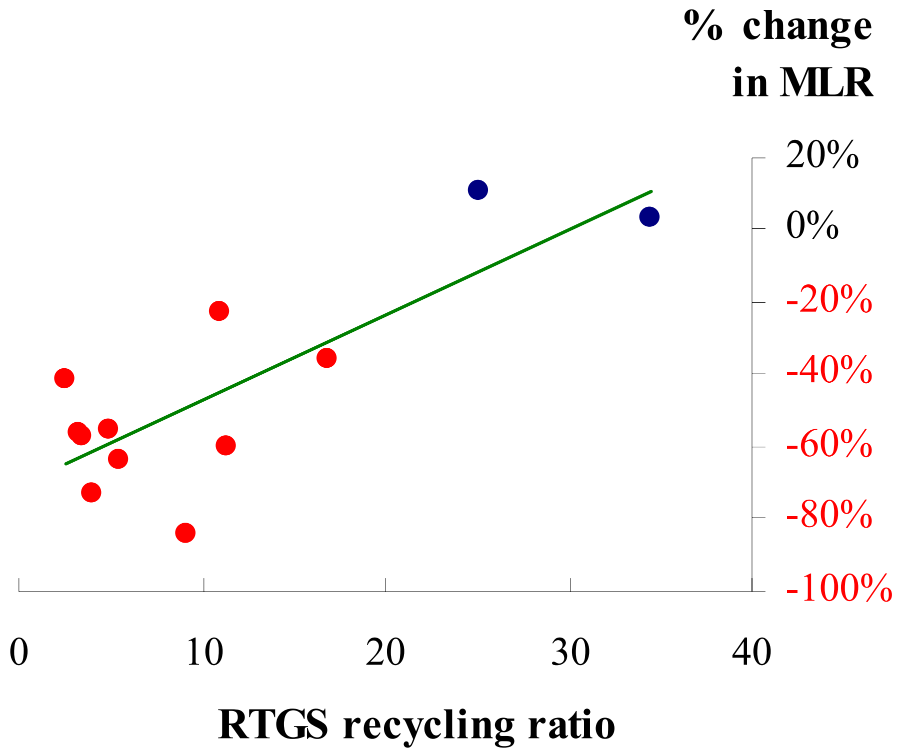
Key difference:

- Drop in volatility is much greater with generated data

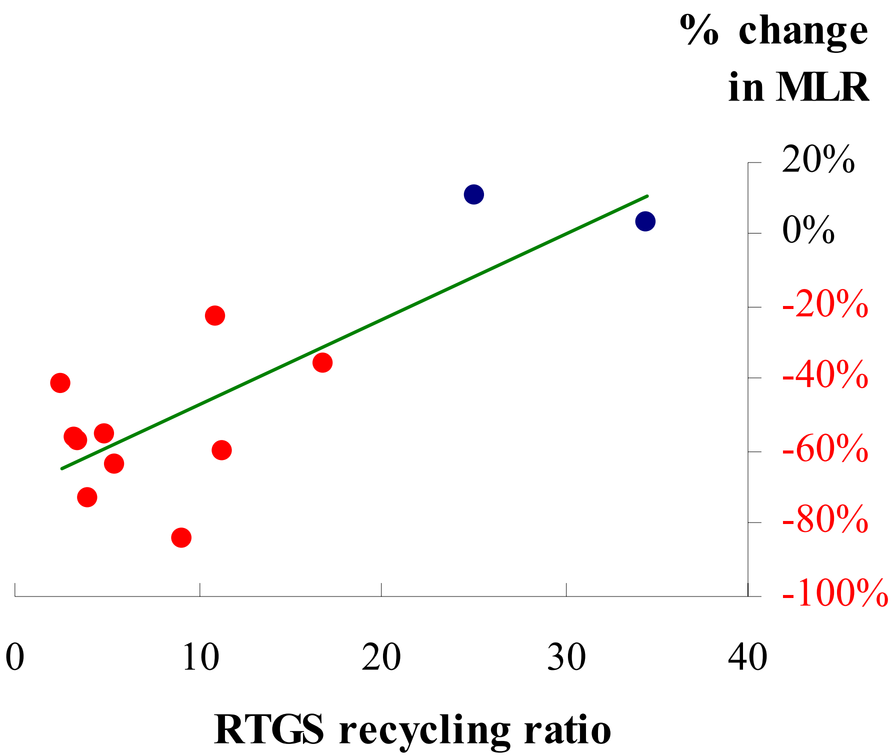
New finding:

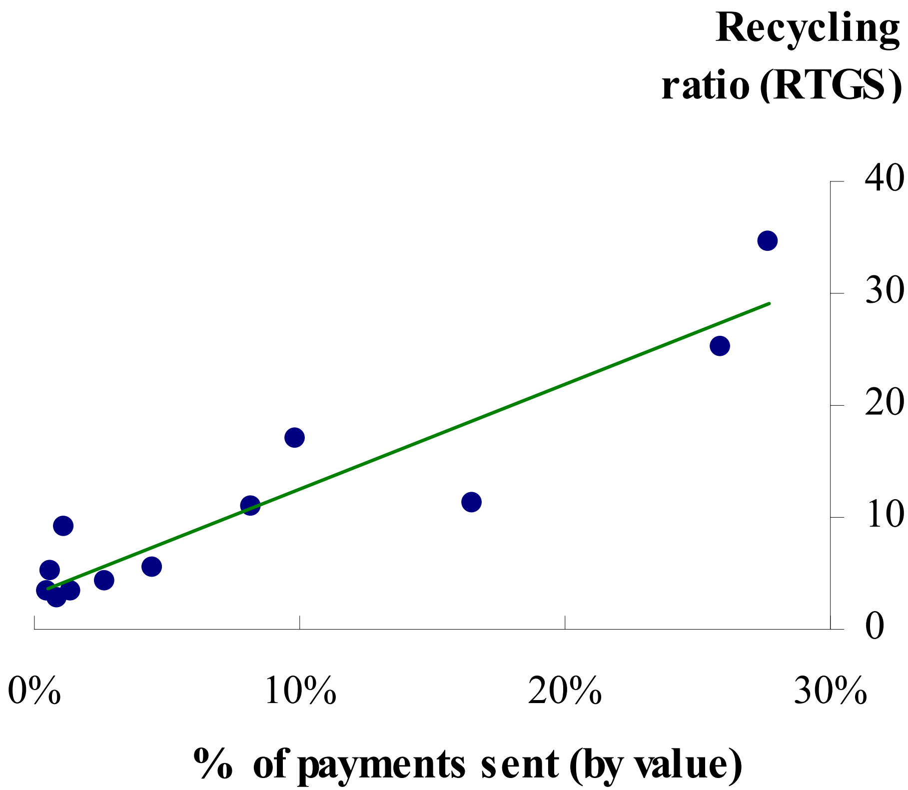
- As the number of banks increases, savings from RR increase (linked to rec. ratios)

Interpretation: Distribution of RR benefits



Interpretation: Distribution of RR benefits

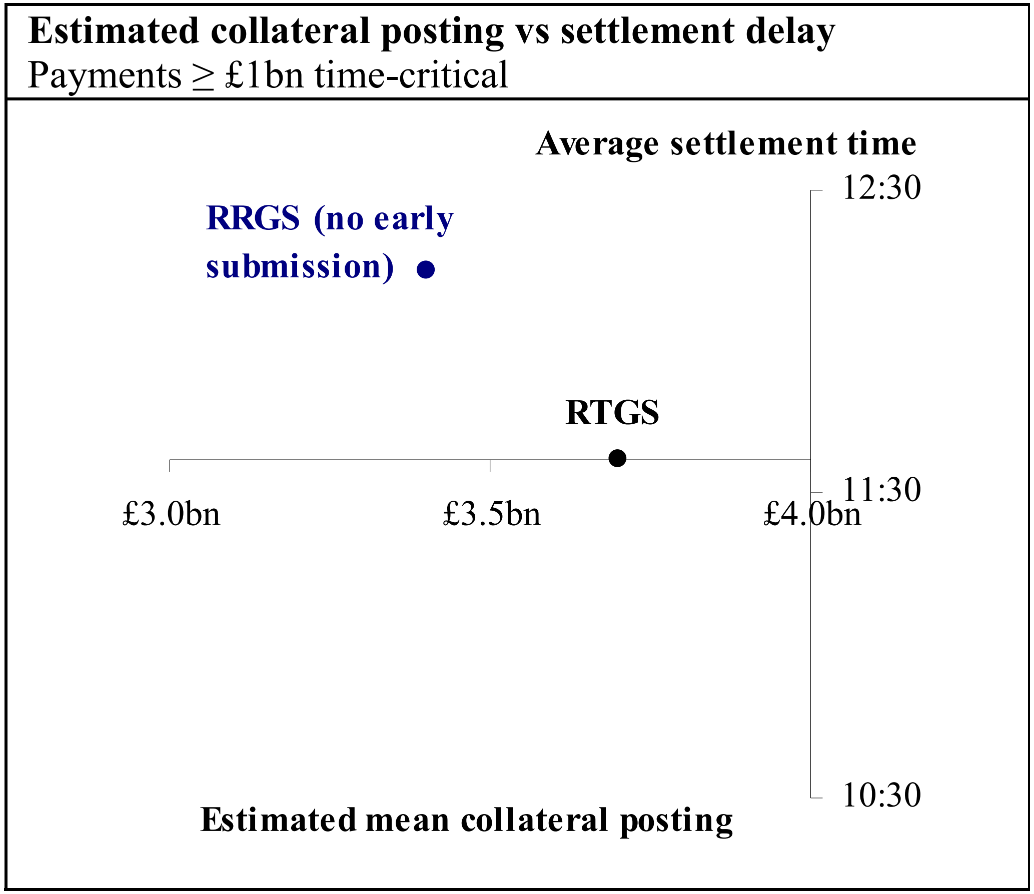




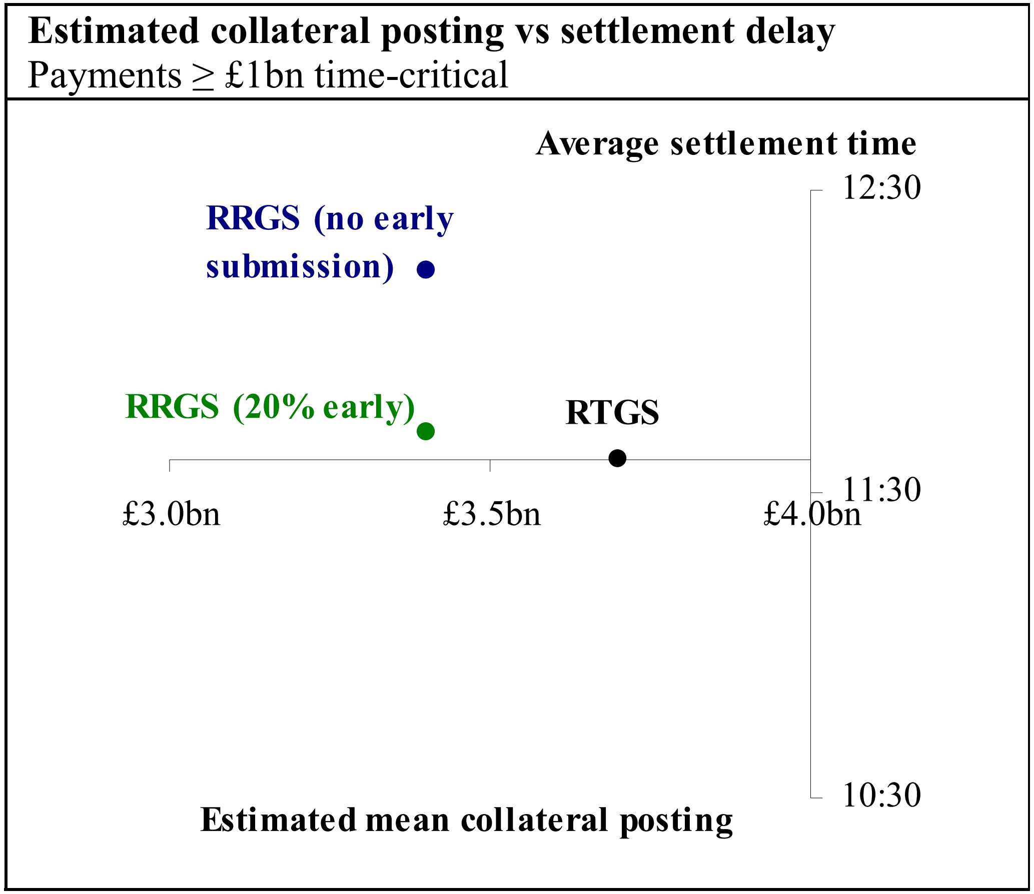
Interpretation: Translating liq. savings into cost savings

- Estimate impact of **mean** and **standard dev.** of max liquidity requirements on banks' collateral posting decisions
- Borrowing regression analysis from James and Willison (2004)

Collateral cost vs Settlement delay



Collateral cost vs Settlement delay



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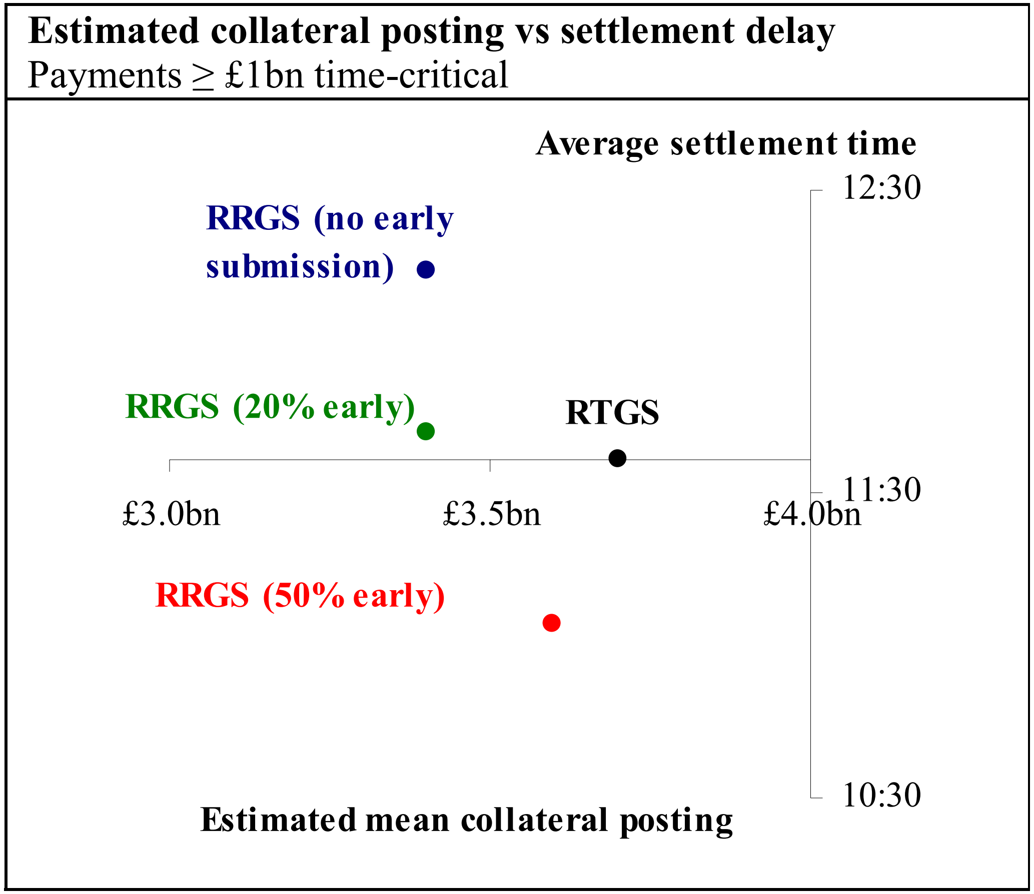

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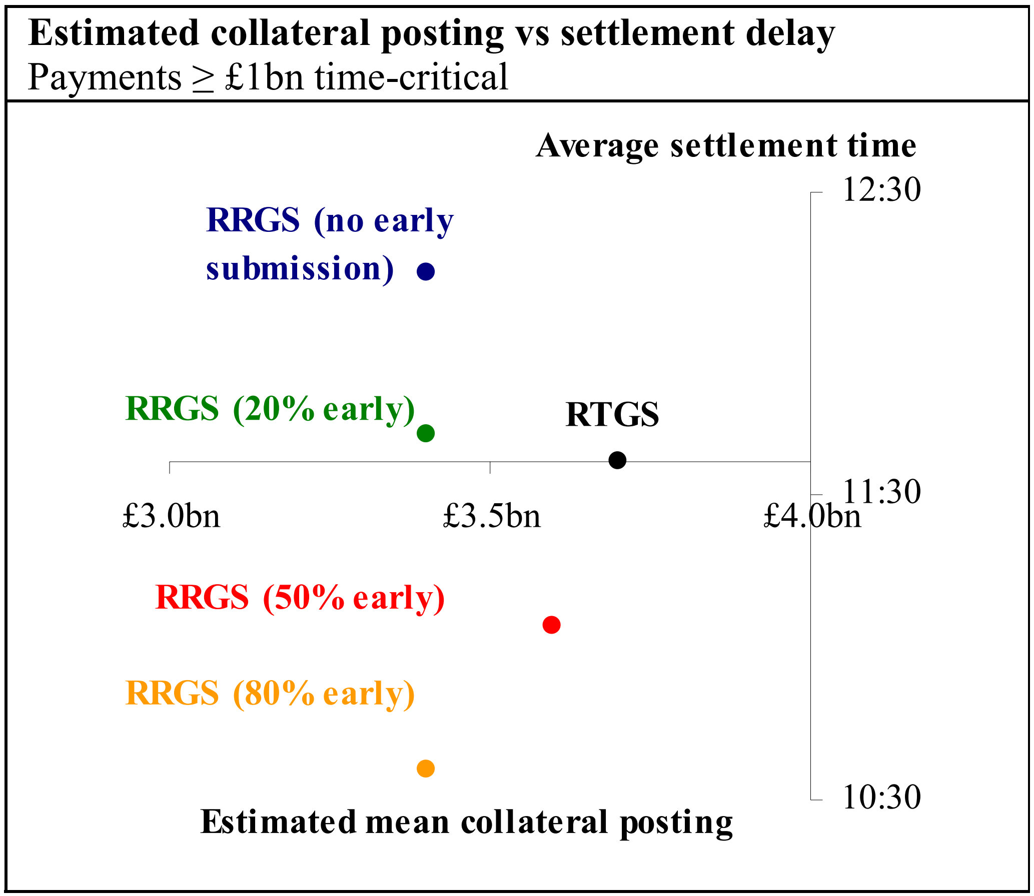

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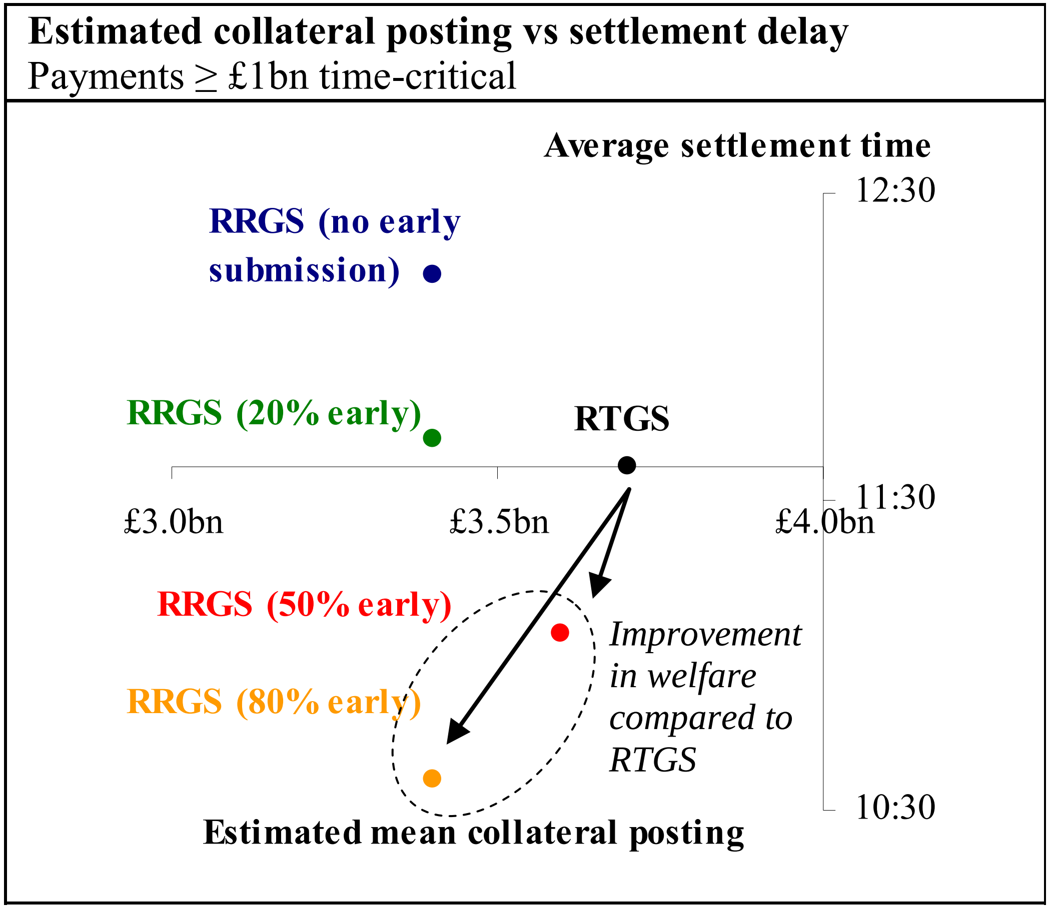

Summary: CHAPS

- RRGS could reduce collateral posting in CHAPS
- Change in average settlement time very dependent on assumptions
- Uneven distribution of benefits among banks

Summary: General

- Magnitude of RRGS impact depends on the characteristics of existing system:

i. Liquidity efficiency (recycling ratio)

ii. Payment delay (internal)

iii. Proportion and profile of time-critical payments

Extensions

- Balance-reactive functionality
- Impact of RRGS under stressed circumstances
- Gridlock resolution
- More detailed analysis of banks' payment submission incentives under RRGS